Life-history, ecology and fishery of *Sepia officinalis* in the western Mediterranean

S. Keller*, M. Valls, A. Quetglas

Instituto Español de Oceanografía, Centre Oceanogràfic de les Balears, Moll de Ponent, 07015 Palma, Spain

**Corresponding author. E–mail: stefanie.keller@ba.ieo.es*

Background

Cephalopods constitute important resources for different Mediterranean fisheries such as trawl, artisanal and recreational fleets. Cuttlefish (*Sepia officinalis*) has been caught there from ancient times on and holds an important seasonal artisanal fishery in the Balearic Islands (western Mediterranean). This neritic demersal species shows a typical seasonal migration linked with reproduction and growth, moving towards coastal waters for spawning. The local coast trammel net fishery (mixed bottoms, 2–30 m depth) takes advantage of this accumulation, even though the species is also taken by bottom trawlers throughout the year at greater depths.

Combining biological and fishery data

In this work we have the opportunity to combine biological and landings data resulting from different fishing methods, trawl and artisanal fleet, working at different areas and depth strata. These data give a good inside on the intra- and interannual fluctuations of *S. officinalis* distribution and abundance around the Balearic Islands.

Objective

Apart from giving a comprehensive insight on the life cycle of this species linking ecology and life-history traits to seasonal fishery trends, another objective of our study was to assess the influence of various environmental factors on the abundance of *Sepia officinalis*. Different climatic indices and other environmental variables were selected for analysis in accordance to previous findings.

Material and Methods

Available data

- Monthly (January-July) biological samplings (N=805) from artisanal boats (2007-2008)
- Official fishery landings (trawl and artisanal) (1965-2011)
- Size samplings on board commercial bottom trawlers (2001-2011)
- Biological and size samplings during spring scientific trawl surveys (2001-2011)
- Time series of environmental data (SST, Chl a, Rainfall), lunar phases and climate indices (NAO, MO, WeMO, local climatic indicator[3])

Measurements taken and analyses conducted

- Sex, size (ML), body weight (BW), gonad weight (GW), nidamental gland length (NGL), digestive gland weight (DGW)
- Population structure (size distributions, sex –ratio), length-weight relationships (LWR)
- Reproductive (GSI, NGI) and metabolic (DGI) indices

General Additive Models (GAM)

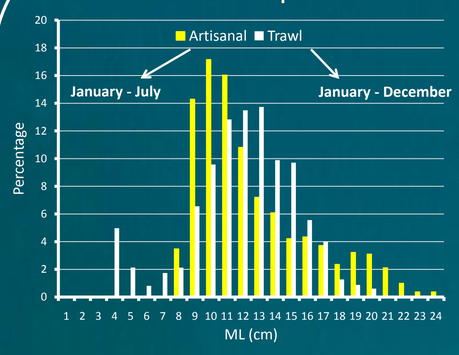
Somatic Condition ~ Month + ML + Reproductive Condition

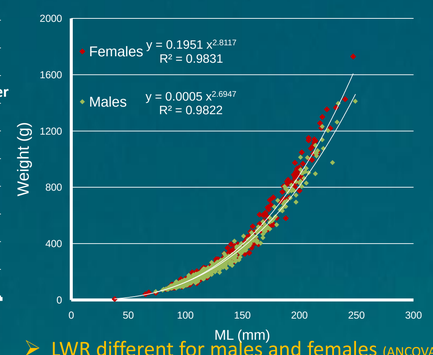
Landings ~ Month + Environmental Factors

Results and Discussion

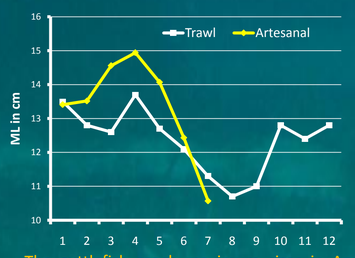
BIOLOGY

Population structure and LWR

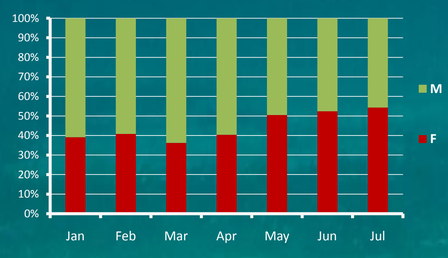




➢ LWR different for males and females (ANCOVA)

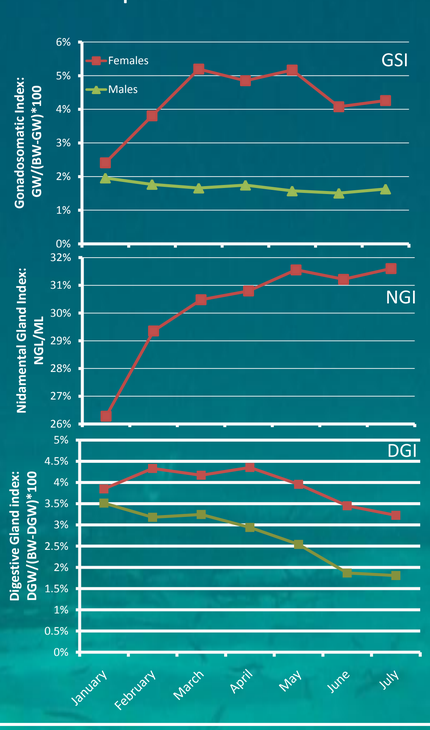


The cuttlefish reach maximum sizes in April. Bigger animals leave the coastal waters first and young animals start to recruit to the trawl fishery at the end of summer.



➢ Unequal in January-April (χ^2 test)
Results different from literature, where mostly 1:1 or dominance of females[4,5]

Reproductive and metabolic indices



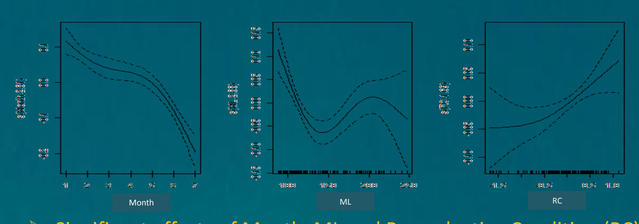
Females:

GSI and NGI high or raising between March and May

➢ Indicator of main reproductive period
➢ High indices until July suggest a protracted reproductive period
➢ Time of this period and its duration varies with area[1,2]

DGI descending from April on:
The metabolism slows down, feeding reduced towards the end of reproduction period

Condition versus reproduction



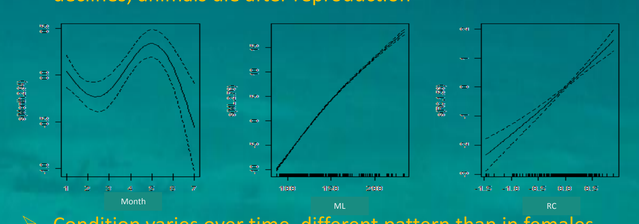
FEMALES

➢ Significant effects of Month, ML and Reproductive Condition (RC) on Somatic Condition (SC)

Dev explained: 45.4%

➢ RC positively correlated with SC: Energy for reproduction more likely to come from food intake than from reallocation of somatic tissue

➢ Condition is best at beginning of the reproductive period, then descending steadily: Energy is invested in reproduction; food intake declines; animals die after reproduction



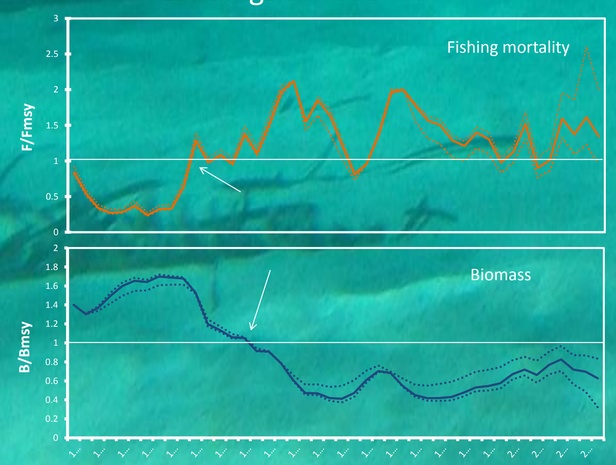
MALES

Dev explained: 99.1%

➢ Condition varies over time, different pattern than in females
➢ Strong link to growth: investment in reproduction lower than in females

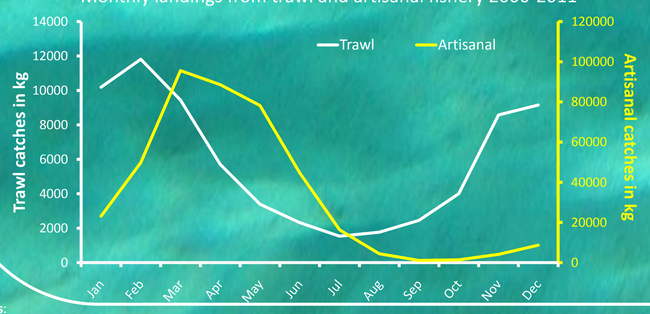
FISHERY

Landings time series



➢ Surplus production models show that the species is over-exploited from about 1980 on, winter catches reduce to half from 1982 on

Monthly landings from trawl and artisanal fishery 2000-2011

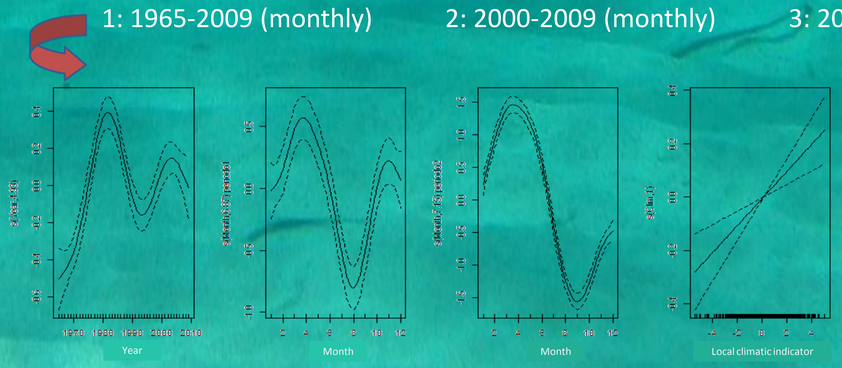


➢ Animals found in coastal waters between January and July
->Artisanal fishery season

➢ Trawl catches increase gradually from July on and peaks in February, a month before the artisanal peak

Environmental influences on landings – GAM results

The influence of different environmental variables on *Sepia* landings was analyzed for different time periods:
1: 1965-2009 (monthly) 2: 2000-2009 (monthly) 3: 2000-2011 (weekly)

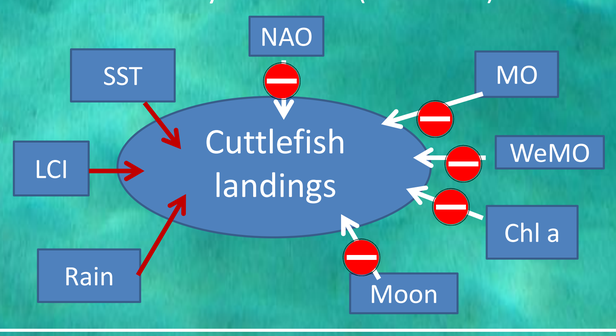


➢ No influence of large-scale climatic phenomena, lunar phase or Chlorophyll a

➢ Similar results by Sobrino et al, 2002 (no influence of SST, rainfall and river discharges)

➢ In English Channel and also for some squid species, SST seems to be of stronger influence[6,10], but the effect (positive, negative) varies even within genera[7,8] and area[4].

Summary of results (all GAMS)



MO: Mediterranean Oscillation
WeMO: Western MO
LCI: Local Climatic Indicator[3]

References:
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